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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/548,637	04/13/2000	John R Koza	50291.P009	6771

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EXAMINER	
WONG, LUT	

ART UNIT	PAPER NUMBER
2129	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/548,637	KOZA ET AL.	
	Examiner	Art Unit	
	LUT WONG	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10-7-2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6, 13, 15-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,13 and 15-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is responsive to an AMENDMENT entered 10-7-2010 for the patent application 09/548637

Status of Claims

Claims 1-6, 13, 15-23 are pending. Claims 1, 22-23 have been amended.

Drawings

Drawing objection is maintained.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-6, 13 and 15-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art (APA), in view of another APA Koza et al (US 5867397), applicant's description of another APA (Ullman, J.R), and Beasley et al ("An overview of Genetic Algorithms: Part 2, Research Topics" 1993).

Note: Applicant's own spec is relied upon for the following claims limitations. In particular, the following limitations are included in the "background of the invention" section of the spec, therefore are considered well known and admitted prior art (APA).

Furthermore, **the general approach of genetic programming** as described in spec pg. 9 serves as the foundation of the rejection (i.e. Main reference).

Claims 1, 22-23:

1. Determining the scope and contents of the prior art.

Claims 1, 22-23:	**Prior arts**
1. (Currently Amended) A computer-implemented process for creating an entity:	**APA.** See e.g. pg. 9, L1, 11-12 which teaches that the feature of *automatically creating design using genetic programming* is known.
initializing a plurality of candidate entities and an iteration count with a predetermined value by supplying, from an external source, at least one	**APA.** See e.g. pg. 9, L3-5 which teaches that the feature of *random initialization and iterative*

candidate entity partially satisfying the predetermined design requirement which includes a characteristic of the reference structure to the initialized plurality of candidate entities, **Examiner Note (EN):** Drawn to *expert* initialization of designs.	*process* is known. **APA.** See also e.g. pg. 8, L9-10 which teaches that the feature of *expert initialization* is known. **Beasley.** See e.g. section 13.
wherein each candidate entity is represented by a tree structure having a plurality of nodes representing a structure of the candidate entity; **EN:** Drawn to tree structure.	**APA.** See e.g. pg. 6, L20 which teaches that the feature of *tree structure* is known.
performing iterative genetic programming operations, each iteration including:	**APA.** See e.g. pg. 9, L3-5 which teaches that the feature of *iterative process* of genetic programming is known.
creating a description of the structure for each of the candidate entities based on its tree structure, analyzing behavior and characteristics based on the description of the structure of each candidate entity, including a simulation of the structure,	**APA.** See e.g. pg. 6 Line 20 which teaches that the feature of *tree structure* is known. **APA.** See also e.g. pg. 9, L3-5 that *design creating and*

EN: drawn to tree structure creation and simulation of behavior	*evaluation of behavior* are known. **Koza.** See e.g. C50 Line 31-49 especially where it states "A *netlist describing* the circuit is then created ….Each circuit is then *simulated* to determine its behavior."
comparing each of the plurality of candidate entities with the reference structure based on the analysis of the behavior and characteristics to obtain an isomorphism value for each candidate entity, the isomorphism value representing a dissimilarity between the respective candidate entity and the reference structure, **EN:** drawn to comparing similarity using isomorphism value	**Ullman.** See e.g. pg. 94 L2-3 of applicant's spec that applicant described subgraph isomorphism algorithm is known and taught by Ulman.
determining a fitness value for each of the candidate entities based on a compliance with the predetermined design requirement and the	**APA.** See e.g. pg. 9, L3-5 which teaches that the feature of measuring *fitness value of each*

isomorphism value of the respective candidate entity, **EN:** drawn to fitness measure using isomorphism value	*design* is known. **Ullman.** See e.g. pg. 94 L2-3 of applicant's spec that applicant described fitness determination using isomorphism algorithm is known.
selecting at least one candidate entity from the plurality of candidate entities that has a fitness value exceeds a predetermined threshold,	**APA.** See e.g. pg. 9, L9-11 which teaches that the feature of *selecting designs based on fitness* is known
creating at least one new candidate entity by creating a variation in the selected at least one candidate entity if the selected at least one candidate does not satisfy the predetermined design requirement or a number of iterations has not reached the predetermined value of the iteration count, including performing one of a reproduction operation, offspring <u>crossover operation, mutation operation, and an architecture altering operation on the at least one selected candidate"</u>	**APA.** See e.g. pg. 9-10 which teach that the features of *reproduction, crossover, mutation, architecture-altering operations are* known.

EN: drawn to creating new population	
terminating the iterations if the selected at least one candidate satisfies the predetermined design requirement or a number of iterations has reached the predetermined value of the iteration count, wherein at least one of the selected candidate entities is used to design an end-result structure in view of the predetermined design requirement, and	**APA.** See e.g. pg. 9, L6 which teaches that the feature of *termination criterion* is known
updating the iteration count at the end of each iteration.	**EN: *inherent.*** The iteration count *must* be updated at the end of each iteration; Otherwise, the iterative process will never stop.

2. Ascertaining the differences between the prior art and the claims at issue.

While creating design is known, APA fails to teaches that "the design satisfies a predetermined design requirement that at least one characteristic is not in a reference structure" as claimed. Hence, the difference is creating *a design* versus *a new (patentable) design*.

While tree structure representation is known, APA fails to explicitly teach simulation of behavior. Hence, the difference is an extra step of simulation of tree structure.

While *expert initialization* is known, APA as described in spec pg. 9 uses *random initialization*. Hence, the difference is *expert initialization* versus *random*.

While *isomorphism algorithm* is known, APA as described in spec pg. 9 fails to teach using such specific algorithm to determine similarly of designs. Hence, the difference is why and how one of ordinary skilled in the art would have modified the APA to use isomorphism algorithm for similarity comparison.

3. Resolving the level of ordinary skill in the pertinent art.

(Objective Evidence) OE1: One of ordinary skill in the art would know that the only difference in "creating a design" to "creating a *novel design*" is adding one more constraint to the multi-objective function. Such constraint is, of course, requiring the designed satisfies a predetermined design requirement that at least one characteristic is not in a reference structure. The Examiner contends that the difference is a common sense to one of ordinary skills in the art.

Furthermore, since Koza ('397) teaches automated design of complex structures using genetic programming (See e.g. applicant's spec pg. 11 L16-20), and automatically creating the topology and sizing for the design using high level statement (See e.g. applicant's spec pg. 11 L16-20), one skilled in the art would know how to add another constraint using high level statement in creating "novel design".

OE2: One of ordinary skill in the art would also know that simulation of structure is well known in the art (See e.g. Koza C50 Line 31-49). One of ordinary skill in the art

would also know that the behavior of each developed structure can be determinate by simulation or observation (See e.g. Koza DETX(17)).

OE3: One of ordinary skill in the art would also know that Isomorphism value and/or isomorphism algorithm as disclosed by Ullman (an APA), is a well known method that can be used to represent similarity/dissimilarity between candidate entity and reference entity (See e.g. applicant's description of Ullman in spec pg. 94).

OE4: One of ordinary skill in the art would also know that initial population can be initialized in two ways: random or expert guided. The applicant also teaches both approaches (See e.g. applicant's spec pgs 8-9). Beasley also made it clear why one skill in the art would use domain knowledge in initializing GA population. See screenshot above that domain knowledge allows more efficient exploration of the search space.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

In view of OE1, one of ordinary skill in the art whom is aware of "novel design" would immediately motivated to added another constraint to the objective function (written in high level statement) or fitness measure in attempted to create a "novel design" However, merely having the motivation to do so does not automatically mean it could be done. To address this problem, one would have to incorporate a reference structure and be able to tell the similarity/dissimilarity between candidate entity and reference entity. In order to do so, one would employ Isomorphism value and/or

isomorphism algorithm, which is a well known method that can be used to compare similarity/dissimilarity between candidate entity and reference entity (In view of OE3). Therefore, one skill in the art would have and could have use isomorphism value to compare similarity/dissimilarity between candidate entity and reference entity with predictable result of creating a "novel design". It is applying known technique to known method ready for improvement. See *MPEP 2142.*

In view of OE2, one of ordinary skill would have and could have further modified the already modified APA (that uses isomorphism algorithm in creating novel design) by further incorporating simulation of structure. One skill in the art would have and could have because of the advantages of simulation, such as determining fitness without actually constructing the structure, and simulation has been widely applied. It is an instance of applying a known technique to a known device (method, or product) ready for improvement to yield predictable results. See *MPEP 2142.*

In view of OE4, one of ordinary skill would have and could have further modified the already modified APA (that uses isomorphism algorithm in creating novel design and simulation of structure) by further incorporating domain knowledge initialization of population with predicted benefits of allows more efficient exploration of the search space. It is applying a known technique to a known device (method, or product) ready for improvement to yield predictable results. See *MPEP 2142.*

Note: Applicant's own spec is relied upon for the following dependent claims. In particular, the following limitations are included in the " background of the invention" section of the spec, therefore are well known and admitted prior art.

Claim 2: (See e.g. applicant's own spec at pg. 9, L15 which teaches that the feature of mutation is known).

Claim 3: (See e.g. applicant's own spec at pg. 2 which teaches that the feature of simulating annealing is known).

Claim 4: (See e.g. applicant's own spec at pg. 2 which teaches that the feature of hill climbing is known).

Claim 5: (See e.g. applicant's own spec at pg. 9 which teaches that the feature of population is known).

Claim 6: (See e.g. applicant's own spec at pg. 9, L13 which teaches that the feature of crossover is known).

Claim 13: (See e.g. applicant's own spec at pg. 9, L3 which teaches that the feature of random process is known).

Claim 15: (See e.g. applicant's own spec at pg. 37, lines 7-9, which teaches that the feature of simulation is known).

Claim 16: (See e.g. applicant's own spec at pg. 37, lines 13-15, which teaches that the feature of avoiding simulation is known).

Claim 17: (See e.g. applicant's own spec at pg. 16, L15-17 on constrained syntactic structure is known).

Claim 18: (See e.g. applicant's own spec at pg. 11, L16-20 and pg. 12, L10-20 which teaches that the feature of electrical circuit is known).

Claim 19: (See e.g. applicant's own spec at pg. 11, L21 and pg 12, L4 which teaches that the feature of controller is known).

Claim 20: (See e.g. applicant's own spec at pg. 12, L4-6 and pg. 13, L3-7 which teaches that the feature of antenna is known).

Claim 21: a mechanical system is obvious over circuit, controller, and antenna. It is merely a simple substitution of one known, equivalent element for another to obtain predictable result. I.e. one can evolve a mechanical system using the same method that evolve circuit, controller and antenna. The only difference is substituting electrical component with mechanical component.

Response to Arguments

Applicant's arguments filed 10-7-2010 have been fully considered but they are not persuasive.

In re pg. 8-9, applicant argues amended limitations are not taught by cited references. In response, see the rejection above that the amended limitations are APA.

In re pg. 10, applicant argues that

> Although Ullman discloses an isomorphism algorithm, there is no suggestion within Ullman to combine with Koza, or vice versa. In fact, there is no mention of Ullman or the term of "isomorphism" in Koza. The fact that the present application references Ullman and its isomorphism algorithm in the specification does not provide any motivation for one with ordinary skill in the art, based on the teachings of Ullman and Koza, to combine Ullman and Koza. Any suggestion to combine Koza and Ullman can only be based on the hindsight of the specification of the present application.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In instant case, as shown above, the use of isomorphism value and/or isomorphism algorithm is based on necessity, not hindsight reasoning.

Furthermore, applicant described in the spec that isomorphism algorithm is taught by Ullman, which means isomorphism algorithm is well known in the art and therefore one skilled in the art would/could have use isomorphism algorithm whenever it is applicable. In instant case, comparing a generated design with a reference design is a perfect use of such algorithm.

To further support the Examiner's position that isomorphism value/algorithm is a well known method that can be used to represent similarity/dissimilarity between candidate entity and reference entity, the applicant can consider a cited but not relied reference by Singh et al ("matching structural shape descriptions using genetic algorithms, 1997). In particular, section 1 and title where structural matching using isomorphism algorithm is well known.

Therefore, the Examiner contends that the use of isomorphism value and/or isomorphism algorithm is based on necessity, not hindsight reasoning. And, such method is well known in the art.

Pertinent prior art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Singh et al ("matching structural shape descriptions using genetic algorithms, 1997.

Koza et al ("AUTOMATED DESIGN OF BOTH THE TOPOLOGY AND SIZING OF ANALOG ELECTRICAL CIRCUITS USING GENETIC PROGRAMMING" 1996) teaches an automated process for designing analog electrical circuits based on the principles of natural selection, sexual recombination, and developmental biology. The design process starts with the random creation of a large population of *program trees* composed of circuit-constructing functions….Each fully developed circuit is translated

into a netlist, *simulated* using a modified version of SPICE, and evaluated as to how well it satisfies the user's design requirements. (EN: See e.g. abstract)

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUT WONG whose telephone number is (571)270-1123. The examiner can normally be reached on M-F 7:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lut Wong/
Examiner, Art Unit 2129

/Donald Sparks/
Supervisory Patent Examiner, Art Unit 2129